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## Material, psychosocial, and socio-demographic determinants of positive mental health in 34 European countries

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## SCHOLARONE ${ }^{\text {" }}$

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# Material, psychosocial, and socio-demographic determinants of positive mental health in 34 European countries 

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#### Abstract

Background Most studies in the field of mental health focus on mental distress and diseases. Little is known on determinants of the new concept positive mental health. Poor positive mental health is a risk factor for depression and increased mortality. Methods Based on the third wave of the European Quality of Life Survey (2011/2012) covering 21066 men and 22569 women in 34 countries, the association between positive mental health and socio-demographic, psychosocial and material factors was assessed. The World Health Organization 5 - Mental Wellbeing Index was used as measure of positive mental health. Poor positive mental health was defined as values below the $25 \%$ percentile of the index. Multilevel logistic regression analyses were performed. Results The prevalence of poor positive mental health was $30 \%$ in women and $24 \%$ in men. Higher age, lower educational status, not working, living alone, practicing religion rarely or never, low social support, low levels of trust, high social exclusion, and various material factors were associated with poor positive mental health in both genders. For women, absence of children was an additional risk factor. Conclusion Material, as well as psychosocial and socio-demographic factors were independently associated with positive mental health. This study gives a first overview on determinants of positive mental health on a European level and could be used as a first basis for preventive policies in the field of positive mental health in Europe.


## Strengths and limitations of this study

- Large dataset with comparable data across Europe, allowed us to study each gender separately and comparability of data between 34 European countries enabled us to give an overall view of determinants of PMH among people in Europe
- Face-to face interviews were conducted
- Relies on self-reported data
- No causal interpretation possible, because of cross sectional nature of study
- Response rate of EQLS was lower than aspired


## BACKGROUND

Mental Health and its determinants have been examined in numerous studies. However, the focus has mainly been on mental ill-health. Yet, good mental health is more than the absence of disorder and disease. According to the definition of the WHO mental health is a "state of well-being in which the individual realizes his skills, cope with the normal stresses of life, can work productively and fruitfully, and is able to make a contribution to his community".[1] The positive dimension of mental health is stressed in WHO's definition of health as stated in its constitution: "Health is a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity."[2] Studies provide empirical support that mental health consists of two dimensions: mental ill-health and positive mental health (PMH) in terms of mental well-being.[3, 4] These two concepts are not two opposite sides of one continuum but rather constitute distinct, though
correlated, axes with independent determinants.[3, 5] Keyes' two-continua model demonstrates this way of looking at mental illness and PMH.[5] The one continuum reflects the presence or absence of mental illness, and overlaps in part with the other continuum, which represents the presence or absence of PMH.[6]

The study of PMH is relatively young and there is still discussion on a common definition of PMH.[7] Nevertheless there is agreement that a multi-dimensional measure is needed to accurately assess PMH.[4, 8, 9] PMH is not only a benefit in itself, but poor PMH in terms of low levels on the continuum of positive mental health has been described as a risk factor for depression [10, 11] and absence of PMH has been associated with an increased risk of mortality.[12] Positive mental health can be influenced by socio-demographic, psychosocial or material factors.[13-16] Epidemiological studies investigating PMH are rare. Those studies that do focus on PMH investigated only few factors and looked at one country or at a very limited number of countries. To our knowledge no study exists that analyses a broad set of determinants of PMH in several countries simultaneously. The objective of our study was therefore to examine the association between socio-demographic, psychosocial, and material factors and PMH in the whole region of Europe taking gender differences into account.

## METHODS

## Sample

This study is based on the European Quality of life Survey (EQLS),[17] which is run every 4 years by the European Foundation for the improvement of living and working conditions. The third wave of the EQLS, which was carried out in 2011/2012 included people aged 18 years and older from 34 countries (EU-27, Croatia, Iceland, Montenegro, Former Yugoslav Republic of Macedonia, Serbia, Turkey, Kosovo). In all countries, data was collected via face-to-face interviews at respondents' home that were selected by multistage random sampling. The overall response rate was $41 \%$. A more detailed description of the EQLS 2012 can be found elsewhere.[18]

## Positive Mental Health

Positive Mental Health was measured with the World Health Organization 5 - Mental Wellbeing Index (WHO-5).[19] It is calculated from responses to five items: a) I have felt cheerful and in good spirits; b) I have felt calm and relaxed; c) I have felt active and vigorous; d) I woke up feeling fresh and rested; e) my daily life has been filled with things that interest me. The degree to which the aforesaid positive feelings were present in the last two weeks is scored on a 6-point Likert scale ranging from 0 'at no time' to 5 'all of the time'. The scores to these five questions can amount to a maximum of 25 , which is then multiplied by 4 to get to a maximum of 100 , in which 0 corresponds with worst thinkable well-being and 100 equals best thinkable well-being. The WHO-5 is considered a
valid instrument to evaluate PMH in population based studies.[20] An average score of the index was calculated for the study population and those with values below the $25 \%$ percentile were considered to have poor PMH.

## Potential determinants of positive mental health

Three groups of determinants of PMH were studied: socio-demographic, psychosocial, and material factors. This classification of determinants was inspired by studies that have used this classification in the field of self-rated health.[21, 22]

Socio-demographic factors were: age, educational level (categorized into three groups according to the International Standard Classification of Education), urbanization level (living in rural/urban area) and citizenship (European/ non-European). All these variables were categorical variables. Since potential risk factors might have different meaning for men and women, gender was not considered as potential risk factor but as a structural variable and thus potential effect modifier. Therefore, all analyses were stratified by gender.[23]

Psychosocial factors were: Marital status, presence of children, social support (help from family/friends/neighbour/service provider in case of need for help around the house, advice, looking for a job, feeling depressed, financial problems; five items), social network (frequency of contact with family/friends/neighbours; eight items), political participation (attended a meeting of a trade union/political party/political action group, attended protest or demonstration, signed a petition, contacted a politician/public official; four items), trust (in parliament/legal system/press/police/government/local authorities; 6 items), religion (frequency of attending religious services), social exclusion (feelings of lack of recognition/confusion in life/exclusion/inferiority; four items). Marital status, presence of children, and religion were categorical variables. For social network, social support, political participation, trust, and social exclusion, average scores were calculated and the median was used as cut-off point for the creation of dichotomized variables.

Material factors were: household tenure, housing problems (shortage of space, rot in windows/ doors/floors, damp/leaks in walls/roof, lack of bath or shower/indoor flushing toilet, place to sit outside; six items), neighbourhood problems (noise/air pollution/quality of drinking water/crime/violence/vandalism/litter/ traffic; six items), material deprivation (not able to afford the following amenities/activities: heating/vacation/furniture/meal with meat, chicken, fish every second day/new clothes/having friends and family for drinks or meals at least once a month; six items), financial problems (problems paying bills for rent/informal and consumer loans/electricity; four items), quality of public services (health services/education system/public transport/long term care/child care services/state pension system/social housing; six items).

Household tenure was a categorical variable. Housing problems, neighbourhood problems, financial problems, material deprivation, and quality of public services were dichotomized at the median of the average score of the items.

## Statistical methods

First the distribution of socio-demographic, psychosocial, and material factors were described separately for men and women, and the percentage of poor PMH was reported for each category. The association between the potential determinants and PMH was examined using multilevel logistic regression analysis. Three separate models for women and men were computed to study the association of the groups of determinants (socio-demographic, psychosocial, and material factors) and PMH independently (model 1-3). After that, all variables that were significant at $\alpha=0.05$ for at least one gender were included in the final model (model 4). Multilevel models are particularly appropriate for research designs where data for participants are organized on more than one level to take into account the between- and within variability of these hierarchically organized data (individuals, region, country).[24] Hence, individual determinants were introduced as fixed effects, and country and region were used as random effects in the multilevel analysis taking into account three levels of data: individuals clustered in 330 regions, which are clustered in 34 countries.

Although interrelations between factors were found, no collinearity was detected, as the variance inflation factor was never greater than 1.9. Variance inflation factors greater than 2.5 may be problematic.[25]

Since determinants of PMH have only rarely been studied, no literature on potential interactions was available. However, gender differences have been suggested in this context [14, 26] and men and women have different life circumstances. Therefore, we studied men and women separately.

All statistical analyses were conducted using SAS statistical software version 9. The product of the design weight and post-stratification weight was used as weighting factor as recommended in the EQLS guidelines. In sensitivity analyses multilevel logistic regressions were conducted without weights, and with weights. The parameter estimates were substantially similar. Therefore the unweighted Odds Ratios are presented, as advised by Winship and Radbill,[27] because they are more efficient and the standard error is correct.

## RESULTS

Overall, 21066 men and 22569 women participated in the study and were considered for the present analysis. Table 1 shows the distribution of socio-demographic, psychosocial, and material factors and the percentage of people with poor PMH in each category for men and women separately. Overall, the proportion of poor PMH was higher in women than in men ( $30 \%$ vs $24 \%$ ). Furthermore, women
in the study sample were slightly older, and more often had a low education, did not work, had children, practiced religion, did not engage in political participation, were affected by material deprivation. The prevalence of poor mental health ranged from $9.50 \%$ in Iceland to $36.13 \%$ in Serbia among men and from $15.25 \%$ in Finland to $45.16 \%$ in Serbia among women (results not shown).

Table 1 Percentages of men and women with poor positive mental health by socio-demographic, psychosocial, and material factors*

|  | Men |  |  | Women |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | N | \% | \% poor PMH | N | \% | \% poor PMH |
| PMH |  |  |  |  |  |  |
| Good | 15997 | 76 |  | 15751 | 70 |  |
| Poor | 5069 | 24 |  | 6818 | 30 |  |
| Socio-demographic factors |  |  |  |  |  |  |
| Age (Years) |  |  |  |  |  |  |
| 18-24 | 2707 | 13 | 16 | 2539 | 11 | 22 |
| 25-34 | 3919 | 19 | 21 | 3742 | 17 | 24 |
| 35-49 | 5847 | 28 | 25 | 5925 | 26 | 29 |
| 50-64 | 4932 | 23 | 27 | 5227 | 23 | 32 |
| 65+ | 3662 | 17 | 28 | 5136 | 23 | 38 |
| Education |  |  |  |  |  |  |
| Primary or less | 1971 | 9 | 36 | 3090 | 14 | 44 |
| Secondary | 13945 | 67 | 24 | 13983 | 62 | 30 |
| Tertiary | 5004 | 24 | 19 | 5366 | 24 | 22 |
| Working |  |  |  |  |  |  |
| Yes | 11494 | 55 | 20 | 8955 | 40 | 24 |
| no | 9573 | 45 | 29 | 13614 | 60 | 34 |
| Urbanization level |  |  |  |  |  |  |
| Countryside or village | 9774 | 47 | 25 | 10325 | 46 | 31 |
| Town or city | 11247 | 54 | 24 | 12187 | 54 | 30 |
| Citizenship |  |  |  |  |  |  |
| European | 20509 | 98 | 24 | 22094 | 98 | 30 |
| Non-European | 470 | 2 | 25 | 409 | 2 | 30 |
| Psychosocial factors |  |  |  |  |  |  |
| Marital status |  |  |  |  |  |  |
| living with partner | 11990 | 57 | 24 | 11678 | 52 | 28 |
| living alone | 8926 | 43 | 24 | 10749 | 48 | 32 |
| Children |  |  |  |  |  |  |
| Present | 13065 | 62 | 26 | 16272 | 72 | 33 |
| Absent | 8001 | 38 | 22 | 6297 | 28 | 24 |
| Religion |  |  |  |  |  |  |
| Practicing often | 4831 | 23 | 25 | 6854 | 31 | 31 |
| rarely | 6875 | 33 | 23 | 7637 | 34 | 29 |
| never | 9255 | 44 | 24 | 7976 | 36 | 31 |
| Social network |  |  |  |  |  |  |
| high | 4097 | 19 | 24 | 4563 | 20 | 31 |
| low | 16969 | 81 | 24 | 18007 | 80 | 30 |
| Social support |  |  |  |  |  |  |
| high | 10070 | 48 | 21 | 10467 | 46 | 26 |
| Low | 10996 | 52 | 27 | 12102 | 54 | 34 |
| Political participation |  |  |  |  |  |  |
| yes | 5410 | 26 | 21 | 4818 | 22 | 25 |
| no | 15268 | 74 | 25 | 17380 | 78 | 32 |
| Level of trust |  |  |  |  |  |  |
| high | 10359 | 49 | 18 | 10947 | 49 | 24 |
| low | 10708 | 51 | 30 | 11623 | 52 | 36 |
| Social exclusion |  |  |  |  |  |  |
| low | 7800 | 37 | 16 | 8200 | 36 | 21 |
| high | 13266 | 63 | 29 | 14369 | 64 | 35 |
| Material factors |  |  |  |  |  |  |
| Neighbourhood problems |  |  |  |  |  |  |
| low | 8024 | 38 | 21 | 8547 | 38 | 27 |
| high | 13043 | 62 | 26 | 14022 | 62 | 32 |
| Housing problems |  |  |  |  |  |  |
| Absent | 13381 | 64 | 20 | 13893 | 62 | 25 |
| Present | 7499 | 36 | 31 | 8455 | 38 | 39 |
| Household tenure |  |  |  |  |  |  |
| tenant | 14606 | 75 | 23 | 15997 | 76 | 30 |
| owner | 4832 | 25 | 25 | 5059 | 24 | 30 |
| Material deprivation |  |  |  |  |  |  |
| Absent | 9843 | 51 | 14 | 8991 | 43 | 18 |
| Present | 9592 | 49 | 33 | 11829 | 57 | 38 |
| Financial problems |  |  |  |  |  |  |
| no | 16207 | 77 | 21 | 17379 | 77 | 27 |
| yes | 4859 | 23 | 35 | 5191 | 23 | 41 |
| Quality of public services |  |  |  |  |  |  |
| good | 5699 | 27 | 17 | 6241 | 28 | 21 |
| poor | 15367 | 73 | 27 | 16329 | 72 | 34 |

* product of the design weight and the post-stratification weight applied


## Models 1-3

Table 2 presents the results for the multilevel logistic regression analyses, with each set of factors being studied separately for men and women. In model 1 (including socio-demographic factors) lower educational level, older age and not working was significantly associated with poor PMH among both genders. Additionally being citizen of a non-European country was associated with poor PMH in women. In model 2 (including socio-demographic and psychosocial factors) living without a partner, practicing religion rarely or never, low social support, low levels of trust, and high levels of social exclusion were significantly associated with poor PMH among both genders, independently of socio-demographic factors. Having no children was additionally associated with poor PMH in women. The strongest effect in model 2 was seen for high social exclusion with an OR of 1.82 (1.68-1.98) for men and 1.80 (1.68-1.92) for women. In model 3 (including socio-demographic factors and material factors) all material factors, except household tenure, were associated with poor PMH among both genders, controlling for socio-demographic characteristics. The highest odds ratio was seen for material deprivation in both genders (OR 2.13 (2.00-2.41) for men and OR 2.17 (2.01-2.35) for women). Urbanization level and social network were not associated with poor PMH in both genders in the respective models, and were therefore not included in model 4.

## Model 4

In model 4 the strongest associations with poor PMH among both genders were observed for higher age, social exclusion ( $O R=1.73$ (1.59-1.90) for men and $O R=1.69$ (1.57-1.81) for women), and material deprivation (OR=1.96 (1.27-1.53) for men and OR=1.93 (1.79-2.08) for women). Moreover, living without a partner, lower education status, not working, practicing religion rarely or never, low social support, social exclusion, and all material factors were significantly associated with poor PMH among both genders. Not having children was only independently associated with poor PMH in women. Being citizen of a non-European country was no longer significant when taking into account all other factors in model 4.

Table 2 Association between socio-demographic, psychosocial, and material factors and positive mental health for men and women

|  | Model 1-3* |  | Model 4 |  |
| :---: | :---: | :---: | :---: | :---: |
| OR (95\% CI) | Men | Women | Men | Women |
| Model 1 <br> Socio-demographic factors |  |  |  |  |
| Age (Years) |  |  |  |  |
| 18-24 | 1.00 | 1.00 | 1.00 | 1.00 |
| 25-34 | 1.78 (1.51-2.08) | 1.37 (1.20-1.56) | 1.65 (1.37-1.98) | 1.27 (1.09-1.50) |
| 35-49 | 2.33 (2.00-2.70) | 1.87 (1.65-2.11) | 2.26 (1.88-2.71) | 1.69 (1.45-1.96) |
| 50-64 | 2.17 (1.88-2.50) | 1.87 (1.65-2.11) | 2.44 (2.03-2.93) | 1.85 (1.59-2.15) |
| 65+ | 1.77 (1.52-2.06) | 1.97 (1.74-2.24) | 2.47 (2.03-3.01) | 2.11 (1.81-2.46) |
| Education |  |  |  |  |
| Primary or less | 1.00 | 1.00 | 1.00 | 1.00 |
| Secondary | 0.66 (0.58-0.74) | 0.68 (0.62-0.74) | 0.73 (0.64-0.83) | 0.76 (0.69-0.84) |
| Tertiary | 0.50 (0.43-0.57) | 0.47 (0.42-0.53) | 0.71 (0.61-0.83) | 0.65 (0.58-0.73) |
| Working |  |  |  |  |
| Yes | 1.00 | 1.00 | 1.00 | 1.00 |
| No | 1.66 (1.52-1.81) | 1.23 (1.18-1.37) | 1.27 (1.15-1.40) | 1.13 (1.05-1.23) |
| Urbanization level |  |  |  |  |
| Countryside or village | 1.00 | 1.00 |  |  |
| Town or city | 1.01 (0.933-1.09) | 1.01 (0.95-1.07) |  |  |
|  |  |  |  |  |
| European | 1.00 | 1.00 | 1.00 | 1.00 |
| Non-European | 1.22 (0.94-1.56) | 1.31 (1.05-1.63) | 1.01 (0.77-1.33) | 1.02 (0.81-1.30) |
| Model 2 <br> Psychosocial factors |  |  |  |  |
| Marital status |  |  |  |  |
| Living with partner | 1.00 | 1.00 | 1.00 | 1.00 |
| Living alone | 1.20 (1.09-1.31) | 1.31 (1.23-1.40) | 1.84 (1.07-1.30) | 1.17 (1.09-1.25) |
| Children |  |  |  |  |
| Present | 1.00 | 1.00 | 1.00 | 1.00 |
| Absent | 0.92 (0.86-1.08) | 0.83 (0.76-0.91) | 1.00 (0.89-1.12) | 0.90 (0.82-0.98) |
| Religion |  |  |  |  |
| Practicing often | 1.00 | 1.00 | 1.00 | 1.00 |
| Rarely | 1.27 (1.15-1.41) | 1.27 (1.18-1.38) | 1.27 (1.14-1.42) | 1.24 (1.14-1.35) |
| Never | 1.11 (1.00-1.23) | 1.09 (1.01-1.17) | 1.13 (1.01-1.26) | 1.08 (1.00-1.17) |
| Social network |  |  |  |  |
| High | 1.00 | 1.00 |  |  |
| Low | 1.03 (0.93-1.13) | 1.04 (0.96-1.12) |  |  |
| Social support |  |  |  |  |
| High | 1.00 | 1.00 | 1.00 | 1.00 |
| Low | 1.30 (1.20-1.41) | 1.44 (1.35-1.54) | 1.20 (1.10-1.31) | 1.29 (1.20-1.38) |
| Political participation $\quad$ 年 |  |  |  |  |
| Yes | 1.00 | 1.00 |  |  |
| No | 0.99 (0.91-1.08) | 1.03 (0.95-1.11) |  |  |
| Level of trust |  |  |  |  |
| High | 1.00 | 1.00 | 1.00 | 1.00 |
| Low | 1.66 (1.53-1.79) | 1.51 (1.42-1.61) | 1.43 (1.31-1.55) | 1.32 (1.23-1.41) |
| Social exclusion |  |  |  |  |
| Low | 1.00 | 1.00 | 1.00 | 1.00 |
| High | 1.82 (1.68-1.98) | 1.80 (1.68-1.92) | 1.73 (1.59-1.90) | 1.69 (1.57-1.81) |
| Model 3 <br> Material factors |  |  |  |  |
| Neighborhood problems |  |  |  |  |
| Low | 1.00 | 1.00 | 1.00 | 1.00 |
| High | 1.16 (1.07-1.27) | 1.12 (1.04-1.20) | 1.13 (1.04-1.23) | 1.07 (1.00-1.15) |
| Housing problems |  |  |  |  |
| Absent | 1.00 | 1.00 | 1.00 | 1.00 |
| Present | 1.46 (1.34-1.60) | 1.58 (1.48-1.69) | 1.40 (1.30-1.52) | 1.52 (1.43-1.63) |
| Household tenure |  |  |  |  |
| Tenant | 1.00 | 1.00 |  |  |
| Owner | 1.00 (0.89-1.11) | 1.00 (0.91-1.08) |  |  |
| Material deprivation |  |  |  |  |
| Absent | 1.00 | 1.00 | 1.00 | 1.00 |
| Present | 2.19 (2.00-2.41) | 2.17 (2.01-2.35) | 1.96 (1.78-2.15) | 1.93 (1.79-2.08) |
| Financial problems |  |  |  |  |
| No | 1.00 | 1.00 | 1.00 | 1.00 |
| Yes | 1.57 (1.42-1.73) | 1.39 (1.29-1.51) | 1.50 (1.34-1.63) | 1.33 (1.23-1.43) |
| Quality of public services |  |  |  |  |
| Good | 1.00 | 1.00 | 1.00 | 1.00 |
| Poor | 1.54 (1.40-1.70) | 1.64 (1.51-1.77) | 1.39 (1.27-1.53) | 1.51 (1.40-1.63) |

## DISCUSSION

This is one of the first studies to examine PMH in a large Europe wide sample and to our knowledge the first to report on a wide range of determinants. We grouped the determinants that have individually been reported in the literature with regard to mental health. Our study found a broad range of risk factors for poor PMH and our results are mainly in line with previous research that showed similar associations in single countries or single correlates, not controlling for other factors. However, most studies so far have looked at mental illness and not at PMH. Other studies covering more positive aspects of mental health used single questions about happiness or life satisfaction. This approach is not the same as the concept of PMH, since it only covers the hedonistic perspective of wellbeing, in the sense of feeling happy.[28]

A large number of associations between socio-demographic, psychosocial, and material risk factors and PMH in citizens from 34 European countries were found in this study. Higher age, lower educational status and not working were associated with poor PMH among both genders. Of the psychosocial factors, practicing religion rarely or never, low social support, low levels of trust, and high social exclusion were associated with poor PMH among both genders. Living alone was associated with PMH in both genders; the OR was higher for men than for women. An association of absence of children and poor PMH was found among women. All material determinants were associated with poor PMH among men and women.

Our results are in line with previous studies reporting that low educational level,[14, 29-31] and not working, $[14,30]$ are associated with poor mental wellbeing. The results on age and indicators of mental wellbeing are controversial, some studies reporting that older age groups are at higher risk for poor mental wellbeing,[14, 16, 29, 32] in accordance with our results, others finding the opposite.[33-35] Associations between living area and mental wellbeing have been reported, however the direction of this relationship is not clear: living in a rural area [14] and living in a large city [16] have been associated with poor PMH. When classifying living area in two categories - urban or rural - we did not find a significant association between living area and PMH. Living alone, [16, 30, 32] Iow social support,[13, 14, 16, 31, 36] loneliness,[14] and exclusion [37] have been associated with poor positive mental- or emotional health and a study in Russia found associations between high levels of trust and high emotional health.[37] We found that not or rarely attending religious services was associated with poor PMH. A previous study reported that frequency of prayer is associated with mental wellbeing.[35] There are some studies investigating the associations of material factors and mental illness. Poor economic condition [16] and neighbourhood problems [15, 36] have been associated with poor mental wellbeing or PMH before. However, research on the effect of other material factors on PMH is lacking.

In the intermediate models 1-3 age, social exclusion and material deprivation showed the strongest association with poor PMH among men and women. These three factors also appeared to have the strongest association with poor PMH in our final model (model 4), examining the effect of all determinants together. Particularly, all material factors were significantly associated with poor PMH in the separate as well as in the complete model, taking further socio-demographic and psychosocial factors into account. This group of determinants has not been studied extensively yet in the context of PMH but rather with regard to self-rated health [21, 22] or mental illness.[38] The fact that these factors stayed significant throughout all models is in agreement with the believe that material factors may have a direct (through biological pathways) or indirect effect (through e.g. behavioural factors) on health outcomes.[22] We might not have found a significant association of household tenure and PMH because there are cultural differences between countries in the approaches of buying a house or living for rent. Hence household tenure might not be an indicator for material prosperity in all countries.

One of the limitations of this study is its cross-sectional nature. When interpreting the relationship between the determinants, it needs to be kept in mind that no causal interpretation is possible. The response rate of $41 \%$ in the third round of the EQLS was lower than aspired and differed across countries.[18] It has been argued that non-participants in epidemiological cohort-studies may be more likely to belong to low social groups and to have poorer health outcomes.[39] This would be a selection bias and the prevalence of poor PMH as well as the association between some determinants, especially material determinants, might be underestimated. This study did not take into account (mediating) behavioural factors (e.g. physical activity), which may play a role in the association with PMH. Physical activity has a positive effect on PMH [40] and it could be hypothesized that living in areas with high neighbourhood problems, might hinder leisure timephysical activity, hence physical activity could be a mediating factor in the association between material factors and PMH. For future studies it would be highly desirable to also include behavioural factors. Although the WHO-5 is a validated and relatively short measure of PMH in population surveys, there are more comprehensive measures to assess this complex construct. Moreover, in this study the cut-off point for poor PMH has been set at the $25 \%$ percentile to look at people that have low levels of PMH. Using medians or quartiles as cut-off point when no official cut-off points are available is common practice. However, a standardized cut-off point for the WHO-5 would be preferable. The study of PMH is relatively young and there is still discussion on a common definition of PMH and different measurements exist. It will take some years to achieve agreement on the appropriate measurement and definition of PMH.[7] In this context it would be worthwhile to also test if instruments are gender sensitive. This study, on the other hand has many strengths. The large dataset with comparable data across Europe, allowed us to study each gender separately and
comparability of data between 34 European countries enabled us to give an overall view of determinants of PMH among people in Europe. It used the WHO-5 as a validated measure for PMH and has analysed a broad picture of potential risk factors. Another strength of this study was that face-to face interviews were conducted.

## Conclusion

This study showed independent associations between various socio-demographic, psychosocial, and material determinants and PMH. Our study provides a first overview of the distribution of determinants and their association with PMH in Europe. Thereby it can be used as a first basis for confirmatory and more specific analysis on determinants of poor mental health as well as for the development of preventive programs or policies in this context.

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## Contributorship Statement:

SD was in charge of designing, analyzing and writing up for the manuscript.
CB advised on statistical analyses and helped to draft the manuscript.
GB participated in the conceptualization of the analyses and in the revision of the manuscript.
All authors read and approved the final manuscript.

## Competing interests None

Data Sharing Statement: We analysed data of the European Quality of Life Survey (EQLS).
Permission to analyse data of the EQLS can be requested at Eurofond
(http://www.eurofound.europa.eu/surveys/faq/index.htm)

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STROBE Statement-checklist of items that should be included in reports of observational studies

|  | $\begin{gathered} \text { Item } \\ \text { No } \\ \hline \end{gathered}$ | Recommendation |
| :---: | :---: | :---: |
| Title and abstract | 1 | (a) Indicate the study's design with a commonly used term in the title or the abstract |
|  |  | (b) Provide in the abstract an informative and balanced summary of what was done and what was found |
| Introduction |  |  |
| Background/rationale | 2 | Explain the scientific background and rationale for the investigation being reported |
| Objectives | 3 | State specific objectives, including any prespecified hypotheses |
| Methods |  |  |
| Study design | 4 | Present key elements of study design early in the paper |
| Setting | 5 | Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection |
| Participants | 6 | (a) Cohort study-Give the eligibility criteria, and the sources and methods of selection of participants. Describe methods of follow-up <br> Case-control study-Give the eligibility criteria, and the sources and methods of case ascertainment and control selection. Give the rationale for the choice of cases and controls <br> Cross-sectional study-Give the eligibility criteria, and the sources and methods of selection of participants |
|  |  | (b) Cohort study-For matched studies, give matching criteria and number of exposed and unexposed <br> Case-control study-For matched studies, give matching criteria and the number of controls per case |
| Variables | 7 | Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable |
| Data sources/ measurement | 8* | For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group |
| Bias | 9 | Describe any efforts to address potential sources of bias |
| Study size | 10 | Explain how the study size was arrived at |
| Quantitative variables | 11 | Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why |
| Statistical methods | 12 | (a) Describe all statistical methods, including those used to control for confounding |
|  |  | (b) Describe any methods used to examine subgroups and interactions |
|  |  | (c) Explain how missing data were addressed |
|  |  | (d) Cohort study-If applicable, explain how loss to follow-up was addressed <br> Case-control study-If applicable, explain how matching of cases and controls was addressed <br> Cross-sectional study-If applicable, describe analytical methods taking account of sampling strategy |

(e) Describe any sensitivity analyses

Continued on next page

| Results |  |  |
| :---: | :---: | :---: |
| Participants | 13* | (a) Report numbers of individuals at each stage of study-eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed |
|  |  | (b) Give reasons for non-participation at each stage |
|  |  | (c) Consider use of a flow diagram |
| Descriptive data | 14* | (a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders |
|  |  | (b) Indicate number of participants with missing data for each variable of interest |
|  |  | (c) Cohort study-Summarise follow-up time (eg, average and total amount) |
| Outcome data | 15* | Cohort study-Report numbers of outcome events or summary measures over time |
|  |  | Case-control study-Report numbers in each exposure category, or summary measures of exposure |
|  |  | Cross-sectional study-Report numbers of outcome events or summary measures |
| Main results | 16 | (a) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, $95 \%$ confidence interval). Make clear which confounders were adjusted for and why they were included |
|  |  | (b) Report category boundaries when continuous variables were categorized |
|  |  | (c) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period |
| Other analyses | 17 | Report other analyses done-eg analyses of subgroups and interactions, and sensitivity analyses |
| Discussion |  |  |
| Key results | 18 | Summarise key results with reference to study objectives |
| Limitations | 19 | Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias |
| Interpretation | 20 | Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence |
| Generalisability | 21 | Discuss the generalisability (external validity) of the study results |
| Other information |  |  |
| Funding | 22 | Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based |

*Give information separately for cases and controls in case-control studies and, if applicable, for exposed and unexposed groups in cohort and cross-sectional studies.

Note: An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at http://www.plosmedicine.org/, Annals of Internal Medicine at http://www.annals.org/, and Epidemiology at http://www.epidem.com/). Information on the STROBE Initiative is available at www.strobe-statement.org.

## BMJ Open

## Material, psychosocial, and socio-demographic determinants are associated with positive mental health in Europe: a cross-sectional study

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| Keywords: | EPIDEMIOLOGY, MENTAL HEALTH, PUBLIC HEALTH |
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## SCHOLARONE ${ }^{\text {w }}$

Manuscripts

# Material, psychosocial, and socio-demographic determinants are associated with positive mental health in Europe: a cross-sectional study 

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Keywords: Positive Mental Health, determinants, Europe, mental well-being, mental health


#### Abstract

Objectives: To investigate the association between psychosocial, socio-demographic, and material determinants of positive mental health in Europe.

Design: Cross-sectional analysis of survey data.

Setting: 34 European Countries.

Participants: Representative Europe wide sample consisting of 21066 men and 22569 women aged 18 and over, from 34 European countries participating in the third wave of the European Quality of Life Survey (2011/2012).

Outcome: Positive mental health as measured by the WHO 5 - Mental Wellbeing Index, while the lowest $25 \%$ percentile indicated poor positive mental health.

Results: The prevalence of poor positive mental health was $30 \%$ in women and $24 \%$ in men. Material, as well as psychosocial, and socio-demographic factors were independently associated with poor positive mental health in a Europe wide sample from 34 European countries. When studying all factors together, the highest OR for poor positive mental health was reported for social exclusion (men: $\mathrm{OR}=1.73,95 \% \mathrm{Cl}=1.59-1.90$; women: $\mathrm{OR}=1.69,95 \% \mathrm{Cl}=1.57-1.81$ ) among the psychosocial factors. Among the material factors material deprivation had the highest impact (men: $\mathrm{OR}=1.96$, $95 \% \mathrm{Cl}=1.78-2.15$; women: $\mathrm{OR}=1.93,95 \% \mathrm{Cl}=1.79-2.08$ ).

Conclusion: This study gives a first overview on determinants of positive mental health on a European level and could be used as a first basis for preventive policies in the field of positive mental health in Europe.


## Strengths and limitations of this study

- Large dataset with comparable data across Europe
- Overview of a broad range of material, psychosocial, and socio-demographic determinants of positive mental health among people in Europe
- Stratified analysis to take potential gender differences unto account
- No causal interpretation possible, because of cross sectional nature of study
- Response rate of EQLS was lower than aspired and differed from more than $60 \%$ in Bulgaria, Cyprus, Malta, Poland and Slovakia to below 30\% in Luxembourg and the UK


## BACKGROUND

According to the definition of the WHO mental health is a "state of well-being in which the individual realizes his skills, cope with the normal stresses of life, can work productively and fruitfully, and is able to make a contribution to his community".[1] Studies provide empirical support that mental health consists of two independent dimensions: mental ill-health and positive mental health (PMH) or mental wellbeing.[2, 3] Recent studies that have explicitly considered levels of positive mental health $(P M H)$ in populations have illustrated that good mental health is more than just the absence of disease, $[2,4,5]$ and that people can experience PMH even if diagnosed with a mental illness.[3] This is because mental wellbeing or PMH and mental illness are caused by different factors.[6] It has also been shown that low PMH is a risk factor for depression $[7,8]$ and absence of PMH has been associated with an increased risk of mortality.[2, 9]

The study of PMH is relatively young and there is still discussion on a common definition of PMH or mental wellbeing.[10] There are two (complementary) traditions in conceptualizing well-being: the hedonic approach emphasises feeling good (happiness, pleasant affect, life satisfaction) whereas the eudaimonic approach focuses on optimal social and psychological functioning.[5] A valid measure of PMH should include items that assess both - the hedonic and eudaimonic domain.[3, 5, 11, 12] Whereas various studies examined determinants of mental ill health, profound knowledge of determinants of positive mental health is lacking. Positive mental health can be influenced by sociodemographic, psychosocial or material factors.[13-16] However, to date studies that focus on PMH investigated only few determinants and looked at one country or at a very limited number of countries. Whereas prevalences of PMH in European countries have been reported before [17], no study so far has analysed a broad set of determinants of PMH considering a high number of European countries. The objective of our study was therefore to examine the association between socio-demographic, psychosocial, and material factors and PMH at a European level taking gender differences into account.

## METHODS

## Sample

This study is based on the European Quality of life Survey (EQLS), which is run every 4 years by the European Foundation for the improvement of living and working conditions. The third wave of the EQLS, which was carried out in 2011/2012 included people aged 18 years and older from 34 countries (EU-27, Croatia, Iceland, Montenegro, Former Yugoslav Republic of Macedonia, Serbia, Turkey, Kosovo). In all countries, data was collected via face-to face interviews at respondents' home that were selected by multistage random sampling. The overall response rate was $41 \%$. A more detailed description of the EQLS 2012 can be found elsewhere.[18]

## Positive Mental Health

Positive Mental Health was measured with the World Health Organization 5 - Mental Wellbeing Index (WHO-5).[19] It is calculated from responses to five items: a) I have felt cheerful and in good spirits; b) I have felt calm and relaxed; c) I have felt active and vigorous; d) I woke up feeling fresh and rested; e) my daily life has been filled with things that interest me. The degree to which the aforesaid positive feelings were present in the last two weeks is scored on a 6-point Likert scale ranging from 0 'at no time' to 5 'all of the time'. The scores to these five questions can amount to a maximum of 25 , which is then multiplied by 4 to get to a maximum of 100 , where 0 corresponds with worst thinkable well-being and 100 equals best thinkable well-being. The WHO-5 is considered a valid instrument to evaluate PMH in population based studies [20] and assesses PMH with items covering the eudaimonic perspective on wellbeing as well as items covering the hedonic dimensions of wellbeing.[17] An average score of the index was calculated for the study population and those with values below the $25 \%$ percentile were considered to have poor PMH .

## Potential determinants of positive mental health

Three groups of determinants of PMH were studied: socio-demographic, psychosocial, and material factors. This classification of determinants was inspired by studies that have used this classification in the field of self-rated health.[21-23]

Socio-demographic factors were: age, educational level (categorized into three groups according to the International Standard Classification of Education), urbanization level (living in rural/urban area) and citizenship (European/ non-European). All these variables were categorical variables. Since potential risk factors might have different meaning for men and women, gender was not considered as potential risk factor but as a structural variable and thus potential effect modifier. Therefore, all analyses were stratified by gender.[24]

Psychosocial factors were: Marital status, presence of children, social support (help from family/friends/neighbour/service provider in case of need for help around the house, advice, looking for a job, feeling depressed, financial problems; five items), social network (frequency of contact with family/friends/neighbours; eight items), political participation (attended a meeting of a trade union/political party/political action group, attended protest or demonstration, signed a petition, contacted a politician/public official; four items), trust (in parliament/legal system/press/police/government/local authorities; 6 items), religion (frequency of attending religious services), social exclusion (feelings of lack of recognition/confusion in life/exclusion/inferiority; four items). Marital status, presence of children, and religion were categorical variables. For social network, social support, political participation, trust, and social
exclusion, average scores were calculated and the median was used as cut-off point for the creation of dichotomized variables.

Material factors were: household tenure, housing problems (shortage of space, rot in windows/ doors/floors, damp/leaks in walls/roof, lack of bath or shower/indoor flushing toilet, place to sit outside; six items), neighbourhood problems (noise/air pollution/quality of drinking water/crime/violence/vandalism/litter/ traffic; six items), material deprivation (not able to afford the following amenities/activities: heating/vacation/furniture/meal with meat, chicken, fish every second day/new clothes/having friends and family for drinks or meals at least once a month; six items), financial problems (problems paying bills for rent/informal and consumer loans/electricity; four items), quality of public services (health services/education system/public transport/long term care/child care services/state pension system/social housing; six items).

Household tenure was a categorical variable. Housing problems, neighbourhood problems, financial problems, material deprivation, and quality of public services were dichotomized at the median of the average score of the items.

## Statistical methods

First the distribution of socio-demographic, psychosocial, and material factors was described separately for men and women, and the percentage of poor PMH was reported for each category.

We performed random intercept multilevel logistic regression analyses to examine the association between the potential determinants and PMH.

Multilevel models are particularly appropriate for research designs where data for participants are organized on more than one level to take into account the between- and within variability of these hierarchically organized data (individuals, region, country).[25] The model contains a so-called fixed part and a random component. Individual determinants were introduced as fixed effects, and country and region were used as random intercepts in the multilevel analysis taking into account three levels of data: individuals (level 1) nested in 330 regions (level 2), which are nested in 34 countries (level 3). Three separate models for women and men were computed to study the association of the groups of determinants (socio-demographic, psychosocial, and material factors) and PMH independently (model 1-3). After that, all variables that were significant at $\alpha=0.05$ for at least one gender were included in the final model (model 4). Median odds ratios (MOR) were computed to quantify the country-level variation. MOR is defined as the median value of the odds ratio between the country at highest risk and the country at lowest risk when randomly picking out two countries.[26] The MOR equals 1 if there is no variation between countries and gets larger if the between-country variation increases.[27] The measure is directly comparable with fixed-effects odds ratios.[27]

Although interrelations between factors were found, no collinearity was detected, as the variance inflation factor was never greater than 1.9. Variance inflation factors greater than 2.5 may be problematic.[28]

Since determinants of PMH have only rarely been studied, no literature on potential interactions was available. However, gender differences have been suggested in this context [14, 29] and men and women have different life circumstances. Therefore, we studied men and women separately.

All statistical analyses were conducted using SAS statistical software version 9.3. The product of the design weight and post-stratification weight was used as weighting factor as recommended in the EQLS guidelines. In sensitivity analyses multilevel logistic regressions were conducted without weights, and with weights. The parameter estimates were substantially similar. Therefore the unweighted odds ratios are presented, as advised by Winship and Radbill,[30] because they are more efficient and the standard error is correct.

## RESULTS

Overall, 21066 men and 22569 women participated in the study and were considered for the present analysis. Table 1 shows the distribution of socio-demographic, psychosocial, and material factors and the percentage of people with poor PMH in each category for men and women separately. Overall, the proportion of poor PMH was higher in women than in men ( $30 \%$ vs $24 \%$ ). Furthermore, women in the study sample were slightly older, and more often had a low education, did not work, had children, practiced religion, did not engage in political participation, were affected by material deprivation.

Table 1 Percentages of men and women with poor positive mental health by socio-demographic, psychosocial, and material factors*

|  | Men |  |  | Women |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | N | \% | \% poor PMH | N | \% | \% poor PMH |
| PMH |  |  |  |  |  |  |
| Good | 15,997 | 76 |  | 15,751 | 70 |  |
| Poor | 5,069 | 24 |  | 6,818 | 30 |  |
| Socio-demographic factors |  |  |  |  |  |  |
| Age (Years) |  |  |  |  |  |  |
| 18-24 | 2,707 | 13 | 16 | 2,539 | 11 | 22 |
| 25-34 | 3,919 | 19 | 21 | 3,742 | 17 | 24 |
| 35-49 | 5,847 | 28 | 25 | 5,925 | 26 | 29 |
| 50-64 | 4,932 | 23 | 27 | 5,227 | 23 | 32 |
| 65+ | 3,662 | 17 | 28 | 5,136 | 23 | 38 |
| Education |  |  |  |  |  |  |
| Primary or less | 1,971 | 9 | 36 | 3,090 | 14 | 44 |
| Secondary | 13,945 | 67 | 24 | 13,983 | 62 | 30 |
| Tertiary | 5,004 | 24 | 19 | 5,366 | 24 | 22 |
| Working |  |  |  |  |  |  |
| Yes | 11,494 | 55 | 20 | 8,955 | 40 | 24 |
| no | 9,573 | 45 | 29 | 13,614 | 60 | 34 |
| Urbanization level |  |  |  |  |  |  |
| Countryside or village | 9,774 | 47 | 25 | 10,325 | 46 | 31 |
| Town or city | 11,247 | 54 | 24 | 12,187 | 54 | 30 |
| Citizenship |  |  |  |  |  |  |
| European | 20,509 | 98 | 24 | 22,094 | 98 | 30 |
| Non-European | 471 | 2 | 25 | 409 | 2 | 30 |
| Psychosocial factors |  |  |  |  |  |  |
| Marital status |  |  |  |  |  |  |
| living with partner | 11,990 | 57 | 24 | 11,678 | 52 | 28 |
| living alone | 8,926 | 43 | 24 | 10,749 | 48 | 32 |
| Children |  |  |  |  |  |  |
| Present | 13,065 | 62 | 26 | 16,272 | 72 | 33 |
| Absent | 8,001 | 38 | 22 | 6,297 | 28 | 24 |
| Religion |  |  |  |  |  |  |
| Practicing often | 4,831 | 23 | 25 | 6,854 | 31 | 31 |
| rarely | 6,875 | 33 | 23 | 7,637 | 34 | 29 |
| never | 9,255 | 44 | 24 | 7,976 | 36 | 31 |
| Social network |  |  |  |  |  |  |
| high | 4,097 | 19 | 24 | 4,563 | 20 | 31 |
| low | 16,969 | 81 | 24 | 18,007 | 80 | 30 |
| Social support |  |  |  |  |  |  |
| high | 10,070 | 48 | 21 | 10,467 | 46 | 26 |
| Low | 10,996 | 52 | 27 | 12,102 | 54 | 34 |
| Political participation |  |  |  |  |  |  |
| yes | 5,410 | 26 | 21 | 4,818 | 22 | 25 |
| no | 15,268 | 74 | 25 | 17,380 | 78 | 32 |
| Level of trust |  |  |  |  |  |  |
| high | 10,359 | 49 | 18 | 10,947 | 49 | 24 |
| low | 10,708 | 51 | 30 | 11,623 | 52 | 36 |
| Social exclusion |  |  |  |  |  |  |
| low | 7,800 | 37 | 16 | 8,200 | 36 | 21 |
| high | 13,266 | 63 | 29 | 14,369 | 64 | 35 |
| Material factors |  |  |  |  |  |  |
| Neighbourhood problems |  |  |  |  |  |  |
| Iow | 8,024 | 38 | 21 | 8,547 | 38 | 27 |
| High | 13,043 | 62 | 26 | 14,022 | 62 | 32 |
| Housing problems |  |  |  |  |  |  |
| Absent | 13,381 | 64 | 20 | 13,893 | 62 | 25 |
| Present | 7,499 | 36 | 31 | 8,455 | 38 | 39 |
| Household tenure |  |  |  |  |  |  |
| tenant | 14,606 | 75 | 23 | 15,997 | 76 | 30 |
| owner | 4,832 | 25 | 25 | 5,059 | 24 | 30 |
| Material deprivation |  |  |  |  |  |  |
| Absent | 9,843 | 51 | 14 | 8,991 | 43 | 18 |
| Present | 9,592 | 49 | 33 | 11,829 | 57 | 38 |


| Financial problems |  |  |  |  |  |  |
| :--- | ---: | ---: | ---: | ---: | ---: | ---: |
| no | 16,207 | 77 | 21 | 17,379 | 77 |  |
| yes | 4,859 |  | 23 |  | 35 | 5,191 |

## Models 1-3

Table 2 presents the results for the multilevel logistic regression analyses, with each set of factors being studied separately for men and women. In model 1 , which included socio-demographic factors, lower educational level, older age and not working was significantly associated with poor PMH among both genders. Additionally being citizen of a non-European country was associated with poor PMH in women. In model 2, including socio-demographic and psychosocial factors, living without a partner, practicing religion rarely or never, low social support, low levels of trust, and high levels of social exclusion were significantly associated with poor PMH among both genders, independently of socio-demographic factors. Having no children was additionally associated with poor PMH in women. The strongest effect in model 2 was seen for high social exclusion with an OR of 1.82 ( $95 \% \mathrm{Cl}=1.68$ 1.98) for men and $1.80(95 \%=\mathrm{Cl} 1.68-1.92)$ for women. In model 3 , including socio-demographic factors and material factors, all material factors, except household tenure, were associated with poor PMH among both genders, controlling for socio-demographic characteristics. The highest odds ratio was seen for material deprivation in both genders: The OR for men was 2.13 ( $95 \% \mathrm{Cl}=2.00-2.41$ ) and the OR for women was 2.17 ( $95 \% \mathrm{Cl}=2.01-2.35$ ). Urbanization level and social network were not associated with poor PMH in both genders in the respective models, and were therefore not included in model 4.

## Model 4

In model 4 the strongest associations with poor PMH among both genders were observed for higher age, social exclusion (men: $\mathrm{OR}=1.73,95 \% \mathrm{Cl}=1.59-1.90$; women: $\mathrm{OR}=1.69,95 \% \mathrm{Cl}=1.57-1.81$ ), and material deprivation (men: $\mathrm{OR}=1.96,95 \% \mathrm{Cl}=1.27-1.53$; women: $\mathrm{OR}=1.93,95 \% \mathrm{Cl}=1.79-2.08$ ). Moreover, living without a partner, lower education status, not working, practicing religion rarely or never, low social support, social exclusion, and all material factors were significantly associated with poor PMH among both genders. Not having children was independently associated with poor PMH in women only. Being citizen of a non-European country was no longer significant when taking into account all other factors in model 4.

## Country-level variation

Median odds ratios (MOR) differed only slightly between men and women, but decreased from model one to model 4, where more individual-level information was included. The MOR in model one, where socio-demographic factors are included, was 1.50 for men and 1.45 for women.

However, when studying all factors together in model 4 the MOR was lower, namely 1.31 for men and 1.30 for women. Thus, country-specific variation was larger with regard to effects of sociodemographic factors on mental health, but smaller, considering psychosocial (MOR=1.40 for both genders) or material factors (MOR=1.32 for both genders).

Table 2 Association between socio-demographic, psychosocial, and material factors and poor positive mental health for men and women, results from multilevel logistic regression analyses, showing OR and 95\% CI

|  | Men |  |  |  | Women |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | Model 1 | Model 2* | Model 3* | Model 4 | Model 1 | Model 2* | Model 3* | Model 4 |
| Socio-demographic factors |  |  |  |  |  |  |  |  |
| Age (Years) |  |  |  |  |  |  |  |  |
| 18-24 | 1.00 |  |  | 1.00 | 1.00 |  |  | 1.00 |
| 25-34 | 1.78 (1.51-2.08) |  |  | 1.65 (1.37-1.98) | 1.37 (1.20-1.56) |  |  | 1.27 (1.09-1.50) |
| 35-49 | 2.33 (2.00-2.70) |  |  | 2.26 (1.88-2.71) | 1.87 (1.65-2.11) |  |  | 1.69 (1.45-1.96) |
| 50-64 | 2.17 (1.88-2.50) |  |  | 2.44 (2.03-2.93) | 1.87 (1.65-2.11) |  |  | 1.85 (1.59-2.15) |
| 65+ | 1.77 (1.52-2.06) |  |  | 2.47 (2.03-3.01) | 1.97 (1.74-2.24) |  |  | 2.11 (1.81-2.46) |
| Education |  |  |  |  |  |  |  |  |
| Primary or less | 1.00 |  |  | 1.00 | 1.00 |  |  | 1.00 |
| Secondary | 0.66 (0.58-0.74) |  |  | 0.73 (0.64-0.83) | 0.68 (0.62-0.74) |  |  | 0.76 (0.69-0.84) |
| Tertiary | 0.50 (0.43-0.57) |  |  | 0.71 (0.61-0.83) | 0.47 (0.42-0.53) |  |  | 0.65 (0.58-0.73) |
| Working |  |  |  |  |  |  |  |  |
| Yes | 1.00 |  |  | 1.00 | 1.00 |  |  | 1.00 |
| No | 1.66 (1.52-1.81) |  | - | 1.27 (1.15-1.40) | 1.27 (1.18-1.37) |  |  | 1.13 (1.05-1.23) |
| Urbanization level |  |  |  |  |  |  |  |  |
| Countryside or village | 1.00 |  |  |  | 1.00 |  |  |  |
| Town or city | 1.01 (0.933-1.09) |  |  |  | 1.01 (0.95-1.07) |  |  |  |
| Citizenship |  |  |  |  |  |  |  |  |
| European | 1.00 |  |  | 1.00 | 1.00 |  |  | 1.00 |
| Non-European | 1.22 (0.94-1.56) |  |  | 1.01 (0.77-1.33) | 1.31 (1.05-1.63) |  |  | 1.02 (0.81-1.30) |
| Psychosocial factors |  |  |  |  |  |  |  |  |
| Marital status |  |  |  |  |  |  |  |  |
| Living with partner |  | 1.00 |  | 1.00 |  | 1.00 |  | 1.00 |
| Living alone |  | 1.20 (1.09-1.31) |  | 1.18 (1.07-1.30) | - | 1.31 (1.23-1.40) |  | 1.17 (1.09-1.25) |
| Children |  |  |  |  |  |  |  |  |
| Present |  | 1.00 |  | 1.00 |  | 1.00 |  | 1.00 |
| Absent |  | 0.96 (0.86-1.08) |  | 1.00 (0.89-1.12) |  | 0.83 (0.76-0.91) |  | 0.90 (0.82-0.98) |
| Religion |  |  |  |  |  |  |  |  |
| Practicing often |  | 1.00 |  | 1.00 |  | 1.00 |  | 1.00 |
| Rarely |  | 1.11 (1.00-1.23) |  | 1.27 (1.14-1.42) |  | 1.09 (1.01-1.17) |  | 1.24 (1.14-1.35) |
| Never |  | 1.27 (1.15-1.41) |  | 1.13 (1.01-1.26) |  | 1.27 (1.18-1.38) |  | 1.08 (1.00-1.17) |
| Social network |  |  |  |  |  |  |  |  |
| High |  | 1.00 |  |  |  | 1.00 |  |  |
| Low |  | 1.03 (0.93-1.13) |  |  |  | 1.04 (0.96-1.12) |  |  |
| Social support |  |  |  |  |  |  |  |  |
| High |  | 1.00 |  | 1.00 |  | 1.00 |  | 1.00 |
| Low |  | 1.30 (1.20-1.41) |  | 1.20 (1.10-1.31) |  | 1.44 (1.35-1.54) |  | 1.29 (1.20-1.38) |
| Political participation |  |  |  |  |  |  |  |  |
| Yes |  | 1.00 |  |  |  | 1.00 |  |  |
| No |  | 0.99 (0.91-1.08) |  |  |  | 1.03 (0.95-1.11) |  |  |
| Level of trust |  |  |  |  |  |  |  |  |

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| High |  | 1.00 |  | 1.00 |  | 1.00 |  | 1.00 |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Low |  | 1.66 (1.53-1.79) |  | 1.43 (1.31-1.55) |  | 1.51 (1.42-1.61) |  | 1.32 (1.23-1.41) |
| Social exclusion |  |  |  |  |  |  |  |  |
| Low |  | 1.00 |  | 1.00 |  | 1.00 |  | 1.00 |
| High |  | 1.82 (1.68-1.98) |  | 1.73 (1.59-1.90) |  | 1.80 (1.68-1.92) |  | 1.69 (1.57-1.81) |
| Material factors | A |  |  |  |  |  |  |  |
| Neighborhood problems |  |  |  |  |  |  |  |  |
| Low |  |  | 1.00 | 1.00 |  |  | 1.00 | 1.00 |
| High |  |  | 1.16 (1.07-1.27) | 1.13 (1.04-1.23) |  |  | 1.12 (1.04-1.20) | 1.07 (1.00-1.15) |
| Housing problems |  |  |  |  |  |  |  |  |
| Absent |  |  | 1.00 | 1.00 |  |  | 1.00 | 1.00 |
| Present |  |  | 1.46 (1.34-1.60) | 1.40 (1.30-1.52) |  |  | 1.58 (1.48-1.69) | 1.52 (1.43-1.63) |
| Household tenure |  |  |  |  |  |  |  |  |
| Tenant |  |  | 1.00 |  |  |  | 1.00 |  |
| Owner |  |  | 1.00 (0.89-1.11) |  |  |  | 1.00 (0.91-1.08) |  |
| Material deprivation |  |  |  |  |  |  |  |  |
| Absent |  |  | 1.00 | 1.00 |  |  | 1.00 | 1.00 |
| Present |  |  | 2.19 (2.00-2.41) | 1.96 (1.78-2.15) |  |  | 2.17 (2.01-2.35) | 1.93 (1.79-2.08) |
| Financial problems |  |  |  |  |  |  |  |  |
| No |  |  | 1.00 | 1.00 |  |  | 1.00 | 1.00 |
| Yes |  |  | 1.57 (1.42-1.73) | 1.50 (1.34-1.63) |  |  | 1.39 (1.29-1.51) | 1.33 (1.23-1.43) |
| Quality of public services |  |  |  |  |  |  |  |  |
| Good |  |  | 1.00 | 1.00 |  |  | 1.00 | 1.00 |
| Poor |  |  | 1.54 (1.40-1.70) | 1.39 (1.27-1.53) |  |  | 1.64 (1.51-1.77) | 1.51 (1.40-1.63) |
|  |  |  |  |  |  |  |  |  |
| Random effects |  |  |  |  |  |  |  |  |
| Country level |  |  |  |  |  |  |  |  |
| Between country variance (SE) | 0.1767 (0.05066) | 0.1265 (0.03799) | 0.08360 (0.02876) | 0.07835 (0.02697) | 0.1711 (0.04749) | 0.1258 (0.03594) | 0.08378 (0.02609) | 0.07317 (0.02314) |
| MOR | 1.50 | 1.40 | 1.32 | 1.31 | 1.48 | 1.40 | 1.32 | 1.30 |
| Region level |  |  |  |  |  |  |  |  |
| Between region variance (SE) | 0.07319 (0.01670) | 0.06726 (0.01644) | 0.08601 (0.02034) | 0.08965 (0.02038) | 0.07009 (0.01378) | 0.05600 (0.01303) | 0.05915 (0.01401) | 0.05245 (0.01312) |

${ }^{*}$ Model 2 and 3 have been adjusted for socio-demographic factors of model 1

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## DISCUSSION

This is one of the first studies to examine PMH in a large Europe wide sample and to our knowledge the first to report on a wide range of determinants. We grouped the determinants that have individually been reported in the literature with regard to mental health. Our study found a broad range of risk factors for poor PMH and our results are mainly in line with previous research that showed similar associations in single countries or single correlates, not controlling for other factors. However, most studies so far have looked at mental illness and not at PMH. Other studies covering positive aspects of mental health used single questions about happiness or life satisfaction. This approach is not the same as the concept of PMH, since it only covers the hedonistic perspective of wellbeing, in the sense of feeling happy.[31]

A large number of associations between socio-demographic, psychosocial, and material risk factors and PMH in citizens from 34 European countries were found in this study. Higher age, lower educational status and not working were associated with poor PMH among both genders. Of the psychosocial factors, practicing religion rarely or never, low social support, low levels of trust, and high social exclusion were associated with poor PMH among both genders. Living alone was associated with PMH in both genders. Not having children had a protective effect against poor positive mental health for women but not for men. All material determinants were associated with poor PMH among men and women.

Our results are in line with previous studies reporting that low educational level,[14, 32-34] and not working, $[14,33]$ are associated with poor mental wellbeing. The results on age and indicators of mental wellbeing are controversial, some studies reporting that older age groups are at higher risk for poor mental wellbeing,[14, 16, 32, 35] which would be in in accordance with our results, others finding the opposite.[36-38] Associations between living area and mental wellbeing have been reported, however the direction of this relationship is not clear: living in a rural area [14] and living in a large city [16] have been associated with poor PMH. When classifying living area in two categories - urban or rural - we did not find a significant association between living area and PMH. Living alone,[16, 33, 35] low social support,[13, 14, 16, 34, 39] loneliness,[14] and exclusion [40] have been associated with poor positive mental or emotional health and a study in Russia found associations between high levels of trust and high emotional health.[40] We found that not or rarely attending religious services was associated with poor PMH. A previous study reported that frequency of prayer is associated with mental wellbeing.[38] There are some studies investigating the associations of material factors and mental illness. Poor economic condition [16] and neighbourhood problems [15, 39] have been associated with poor mental wellbeing or PMH before. However, research on the effect of other material factors on PMH is lacking.

In the intermediate models 1-3 age, social exclusion and material deprivation showed the strongest association with poor PMH among men and women. These three factors also appeared to have the strongest association with poor PMH in our final model (model 4), examining the effect of all determinants together. Particularly, all material factors were significantly associated with poor PMH in the separate as well as in the complete model, taking further socio-demographic and psychosocial factors into account. This group of determinants has not been studied extensively yet in the context of PMH but rather with regard to self-rated health [21, 22] or mental illness.[41] The fact that these factors stayed significant throughout all models is in agreement with the believe that material factors may have a direct (through biological pathways) or indirect effect (through e.g. behavioural factors) on health outcomes.[22] We might not have found a significant association of household tenure and PMH because there are cultural differences between countries in the approaches of buying a house or living for rent. Hence household tenure might not be an indicator for material prosperity in all countries.

One of the limitations of this study is its cross-sectional nature. When interpreting the relationship between the determinants, it needs to be kept in mind that no causal interpretation is possible. The response rate of $41 \%$ in the third round of the EQLS was lower than aspired and differed across countries.[18] It has been argued that non-participants may be more likely to belong to low social groups and to have poorer health outcomes.[42] This would be a selection bias and the prevalence of poor PMH as well as the association between some determinants, especially material determinants, might be underestimated. This study did not take into account (mediating) behavioural factors (e.g. physical activity), which may play a role in the association with PMH. Physical activity has a positive effect on PMH [43] and it could be hypothesized that living in areas with high neighbourhood problems might hinder leisure time-physical activity, hence physical activity could be a mediating factor in the association between material factors and PMH. For future studies it would be highly desirable to also include behavioural factors. Although the WHO-5 is a validated and relatively short measure of PMH in population surveys, there are more comprehensive measures to assess this complex construct, which should be used in future studies. Moreover, in this study the cut-off point for poor PMH has been set at the $25 \%$ percentile to look at people that have low levels of PMH. Using medians or quartiles as cut-off point when no official cut-off points are available is common practice. However, a standardized cut-off point for the WHO-5 would be desirable. The study of PMH is relatively young and there is still discussion on a common definition of PMH and different measurements exist. It will take some years to achieve agreement on the appropriate measurement and definition of PMH.[10] In this context it would be highly desirable to also test if instruments are gender sensitive. This study, on the other hand has many strengths. The large dataset with comparable data across Europe, allowed us to study each gender separately and comparability of
data between 34 European countries enabled us to give an overall view of determinants of PMH among people in Europe. It used the WHO-5 as a validated measure for PMH and has analysed a broad picture of potential risk factors.

## Conclusion

This study showed independent associations between various socio-demographic, psychosocial, and material determinants and PMH. Our study provides a first overview of the distribution of determinants and their association with PMH in Europe. Thereby it can be used as a first basis for confirmatory and more specific analysis on determinants of poor PMH as well as for the development of preventive programs or policies in this context.

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## Contributorship Statement:

SD was in charge of designing, analyzing and writing up for the manuscript.
CB advised on statistical analyses and helped to draft the manuscript.
GB participated in the conceptualization of the analyses and in the revision of the manuscript.
All authors read and approved the final manuscript.

## Competing interests None

Data Sharing Statement: We analysed data of the European Quality of Life Survey (EQLS). Permission to analyse data of the EQLS can be requested at Eurofond (http://www.eurofound.europa.eu/surveys/faq/index.htm)

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# Material, psychosocial, and socio-demographic determinants are associated with positive mental health in Europe: a cross-sectional study 

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#### Abstract

Objectives: To investigate the association between psychosocial, socio-demographic, and material determinants of positive mental health in Europe.

Design: Cross-sectional analysis of survey data.

Setting: 34 European Countries.

Participants: Representative Europe wide sample consisting of 21066 men and 22569 women aged 18 and over, from 34 European countries participating in the third wave of the European Quality of Life Survey (2011/2012).

Outcome: Positive mental health as measured by the WHO 5 - Mental Wellbeing Index, while the lowest $25 \%$ percentile indicated poor positive mental health.

Results: The prevalence of poor positive mental health was $30 \%$ in women and $24 \%$ in men. Material, as well as psychosocial, and socio-demographic factors were independently associated with poor positive mental health in a Europe wide sample from 34 European countries. When studying all factors together, the highest OR for poor positive mental health was reported for social exclusion (men: $\mathrm{OR}=1.73,95 \% \mathrm{Cl}=1.59-1.90$; women: $\mathrm{OR}=1.69,95 \% \mathrm{Cl}=1.57-1.81$ ) among the psychosocial factors. Among the material factors material deprivation had the highest impact (men: OR=1.96, $95 \% \mathrm{Cl}=1.78-2.15$; women: $\mathrm{OR}=1.93,95 \% \mathrm{Cl}=1.79-2.08$ ).

Conclusion: This study gives a first overview on determinants of positive mental health on a European level and could be used as a first basis for preventive policies in the field of positive mental health in Europe.


## Strengths and limitations of this study

- Large dataset with comparable data across Europe
- Overview of a broad range of material, psychosocial, and socio-demographic determinants of positive mental health among people in Europe
- Stratified analysis to take potential gender differences unto account
- Face-to-face interviews were conducted
- No causal interpretation possible, because of cross sectional nature of study
- Response rate of EQLS was lower than aspired and differed from more than $60 \%$ in Bulgaria, Cyprus, Malta, Poland and Slovakia to below 30\% in Luxembourg and the UK


## BACKGROUND

According to the definition of the WHO mental health is a "state of well-being in which the individual realizes his skills, cope with the normal stresses of life, can work productively and fruitfully, and is able to make a contribution to his community".[1] Studies provide empirical support that mental health consists of two independent dimensions: mental ill-health and positive mental health (PMH)
or mental wellbeing.[2,3] Recent studies that have explicitly considered levels of positive mental health $(\mathrm{PMH})$ in populations have illustrated that good mental health is not only defined by the more than just the absence of disease, $[2,4,5]$ and that people can experience PMH even if diagnosed with a mental illness.[3] This is because mental wellbeing or PMH and mental illness are caused by different factors.[6] It has also been shown that low PMH is a risk factor for depression [7, 8] and absence of PMH has been associated with an increased risk of mortality.[2, 9]

The study of PMH is relatively young and there is still discussion on a common definition of PMH or mental wellbeing.[10] There are two (complementary) traditions in conceptualizing well-being: the hedonic approach emphasises feeling good (happiness, pleasant affect, life satisfaction) whereas the eudaimonic approach focuses on optimal social and psychological functioning.[5] A valid measure of PMH should include items that assess both - the hedonic and eudaimonic domain.[3, 5, 11, 12] Whereas various studies examined determinants of mental ill health, profound knowledge of determinants of positive mental health is lacking. Positive mental health can be influenced by sociodemographic, psychosocial or material factors.[13-16] Epidemiological studies investigating PMH are fare- However, to date Those studies that-do focus on PMH investigated only few determinants and looked at one country or at a very limited number of countries. Whereas prevalences of PMH in European countries have been reported before [17], no study so far has analysed a broad set of determinants of PMH considering a high number of European countries. The objective of our study was therefore to examine the association between socio-demographic, psychosocial, and material factors and PMH at a European level taking gender differences into account.

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## METHODS

## Sample

This study is based on the European Quality of life Survey (EQLS), which is run every 4 years by the European Foundation for the improvement of living and working conditions. The third wave of the EQLS, which was carried out in 2011/2012 included people aged 18 years and older from 34 countries (EU-27, Croatia, Iceland, Montenegro, Former Yugoslav Republic of Macedonia, Serbia, Turkey, Kosovo). In all countries, data was collected via face-to face interviews at respondents' home that were selected by multistage random sampling. The overall response rate was $41 \%$. A more detailed description of the EQLS 2012 can be found elsewhere.[18]

## Positive Mental Health

Positive Mental Health was measured with the World Health Organization 5 - Mental Wellbeing Index (WHO-5).[19] It is calculated from responses to five items: a) I have felt cheerful and in good spirits; b) I have felt calm and relaxed; c) I have felt active and vigorous; d) I woke up feeling fresh and rested; e) my daily life has been filled with things that interest me. The degree to which the aforesaid positive feelings were present in the last two weeks is scored on a 6-point Likert scale ranging from 0 'at no time' to 5 'all of the time'. The scores to these five questions can amount to a maximum of 25 , which is then multiplied by 4 to get to a maximum of 100 , where 0 corresponds with worst thinkable well-being and 100 equals best thinkable well-being. The WHO-5 is considered a valid instrument to evaluate PMH in population based studies [20] and assesses PMH with items covering the eudaimonic perspective on wellbeing as well as items covering the hedonic dimensions of wellbeing.[17] An average score of the index was calculated for the study population and those with values below the $25 \%$ percentile were considered to have poor PMH.

## Potential determinants of positive mental health

Three groups of determinants of PMH were studied: socio-demographic, psychosocial, and material factors. This classification of determinants was inspired by studies that have used this classification in the field of self-rated health.[21-23]

Socio-demographic factors were: age, educational level (categorized into three groups according to the International Standard Classification of Education), urbanization level (living in rural/urban area) and citizenship (European/ non-European). All these variables were categorical variables. Since potential risk factors might have different meaning for men and women, gender was not considered as potential risk factor but as a structural variable and thus potential effect modifier. Therefore, all analyses were stratified by gender.[24]

Psychosocial factors were: Marital status, presence of children, social support (help from family/friends/neighbour/service provider in case of need for help around the house, advice, looking for a job, feeling depressed, financial problems; five items), social network (frequency of contact with family/friends/neighbours; eight items), political participation (attended a meeting of a trade union/political party/political action group, attended protest or demonstration, signed a petition, contacted a politician/public official; four items), trust (in parliament/legal system/press/police/government/local authorities; 6 items), religion (frequency of attending religious services), social exclusion (feelings of lack of recognition/confusion in life/exclusion/inferiority; four items). Marital status, presence of children, and religion were categorical variables. For social network, social support, political participation, trust, and social exclusion, average scores were calculated and the median was used as cut-off point for the creation of dichotomized variables.

Material factors were: household tenure, housing problems (shortage of space, rot in windows/ doors/floors, damp/leaks in walls/roof, lack of bath or shower/indoor flushing toilet, place to sit outside; six items), neighbourhood problems (noise/air pollution/quality of drinking water/crime/violence/vandalism/litter/ traffic; six items), material deprivation (not able to afford the following amenities/activities: heating/vacation/furniture/meal with meat, chicken, fish every second day/new clothes/having friends and family for drinks or meals at least once a month; six items), financial problems (problems paying bills for rent/informal and consumer loans/electricity; four items), quality of public services (health services/education system/public transport/long term care/child care services/state pension system/social housing; six items).

Household tenure was a categorical variable. Housing problems, neighbourhood problems, financial problems, material deprivation, and quality of public services were dichotomized at the median of the average score of the items.

## Statistical methods

First the distribution of socio-demographic, psychosocial, and material factors was described separately for men and women, and the percentage of poor PMH was reported for each category. We performed random intercept multilevel logistic regression analyses to examine the association between the potential determinants and PMH.

The association between the potential determinants and PMH was examined using multilevel logistic regression analysis.-Multilevel models are particularly appropriate for research designs where data for participants are organized on more than one level to take into account the between- and within variability of these hierarchically organized data (individuals, region, country).[25] The model contains a so-called fixed part and a random component. Individual determinants were introduced as
fixed effects, and country and region were used as random intercepts in the multilevel analysis taking into account three levels of data: individuals (level 1) nested in 330 regions (level 2), which are nested in 34 countries (level 3). Three separate models for women and men were computed to study the association of the groups of determinants (socio-demographic, psychosocial, and material factors) and PMH independently (model 1-3). After that, all variables that were significant at $\alpha=0.05$ for at least one gender were included in the final model (model 4). Median odds ratios (MOR) were computed to quantify the country-level variation. MOR is defined as the median value of the odds ratio between the country at highest risk and the country at lowest risk when randomly picking out two countries.[26] The MOR equals 1 if there is no variation between countries and gets larger if the between-country variation increases.[27] The measure is directly comparable with fixed-effects odds ratios.[27]

Although interrelations between factors were found, no collinearity was detected, as the variance inflation factor was never greater than 1.9. Variance inflation factors greater than 2.5 may be problematic.[28]

Since determinants of PMH have only rarely been studied, no literature on potential interactions was available. However, gender differences have been suggested in this context [14, 29] and men and women have different life circumstances. Therefore, we studied men and women separately.

All statistical analyses were conducted using SAS statistical software version 9.3. The product of the design weight and post-stratification weight was used as weighting factor as recommended in the EQLS guidelines. In sensitivity analyses multilevel logistic regressions were conducted without weights, and with weights. The parameter estimates were substantially similar. Therefore the unweighted odds ratios are presented, as advised by Winship and Radbill,[30] because they are more efficient and the standard error is correct.

## RESULTS

Overall, 21066 men and 22569 women participated in the study and were considered for the present analysis. Table 1 shows the distribution of socio-demographic, psychosocial, and material factors and the percentage of people with poor PMH in each category for men and women separately. Overall, the proportion of poor PMH was higher in women than in men ( $30 \%$ vs $24 \%$ ). Furthermore, women in the study sample were slightly older, and more often had a low education, did not work, had children, practiced religion, did not engage in political participation, were affected by material deprivation. The prevalence of poor mental health ranged from $9.50 \%$ in Iceland to $36.13 \%$ in Serbia among men and from $15.25 \%$ in Finland to $45.16 \%$ in Serbia among women (results not shown).

Table 1 Percentages of men and women with poor positive mental health by socio-demographic, psychosocial, and material factors*

|  | Men |  |  | Women |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | N | \% | \% poor PMH | N | \% | \% poor PMH |
| PMH |  |  |  |  |  |  |
| Good | 15,997 | 76 |  | 15,751 | 70 |  |
| Poor | 5,069 | 24 |  | 6,818 | 30 |  |
| Socio-demographic factors |  |  |  |  |  |  |
| Age (Years) |  |  |  |  |  |  |
| 18-24 | 2,707 | 13 | 16 | 2,539 | 11 | 22 |
| 25-34 | 3,919 | 19 | 21 | 3,742 | 17 | 24 |
| 35-49 | 5,847 | 28 | 25 | 5,925 | 26 | 29 |
| 50-64 | 4,932 | 23 | 27 | 5,227 | 23 | 32 |
| 65+ | 3,662 | 17 | 28 | 5,136 | 23 | 38 |
| Education |  |  |  |  |  |  |
| Primary or less | 1,971 | 9 | 36 | 3,090 | 14 | 44 |
| Secondary | 13,945 | 67 | 24 | 13,983 | 62 | 30 |
| Tertiary | 5,004 | 24 | 19 | 5,366 | 24 | 22 |
| Working |  |  |  |  |  |  |
| Yes | 11,494 | 55 | 20 | 8,955 | 40 | 24 |
| no | 9,573 | 45 | 29 | 13,614 | 60 | 34 |
| Urbanization level |  |  |  |  |  |  |
| Countryside or village | 9,774 | 47 | 25 | 10,325 | 46 | 31 |
| Town or city | 11,247 | 54 | 24 | 12,187 | 54 | 30 |
| Citizenship |  |  |  |  |  |  |
| European | 20,509 | 98 | 24 | 22,094 | 98 | 30 |
| Non-European | 471 | 2 | 25 | 409 | 2 | 30 |
| Psychosocial factors |  |  |  |  |  |  |
| Marital status |  |  |  |  |  |  |
| living with partner | 11,990 | 57 | 24 | 11,678 | 52 | 28 |
| living alone | 8,926 | 43 | 24 | 10,749 | 48 | 32 |
| Children |  |  |  |  |  |  |
| Present | 13,065 | 62 | 26 | 16,272 | 72 | 33 |
| Absent | 8,001 | 38 | 22 | 6,297 | 28 | 24 |
| Religion |  |  |  |  |  |  |
| Practicing often | 4,831 | 23 | 25 | 6,854 | 31 | 31 |
| rarely | 6,875 | 33 | 23 | 7,637 | 34 | 29 |
| never | 9,255 | 44 | 24 | 7,976 | 36 | 31 |
| Social network |  |  |  |  |  |  |
| high | 4,097 | 19 | 24 | 4,563 | 20 | 31 |
| low | 16,969 | 81 | 24 | 18,007 | 80 | 30 |
| Social support |  |  |  |  |  |  |
| high | 10,070 | 48 | 21 | 10,467 | 46 | 26 |
| Low | 10,996 | 52 | 27 | 12,102 | 54 | 34 |
| Political participation |  |  |  |  |  |  |
| yes | 5,410 | 26 | 21 | 4,818 | 22 | 25 |
| no | 15,268 | 74 | 25 | 17,380 | 78 | 32 |
| Level of trust |  |  |  |  |  |  |
| high | 10,359 | 49 | 18 | 10,947 | 49 | 24 |
| low | 10,708 | 51 | 30 | 11,623 | 52 | 36 |
| Social exclusion |  |  |  |  |  |  |
| low | 7,800 | 37 | 16 | 8,200 | 36 | 21 |
| high | 13,266 | 63 | 29 | 14,369 | 64 | 35 |
| Material factors |  |  |  |  |  |  |
| Neighbourhood problems |  |  |  |  |  |  |
| low | 8,024 | 38 | 21 | 8,547 | 38 | 27 |
| High | 13,043 | 62 | 26 | 14,022 | 62 | 32 |
| Housing problems |  |  |  |  |  |  |
| Absent | 13,381 | 64 | 20 | 13,893 | 62 | 25 |
| Present | 7,499 | 36 | 31 | 8,455 | 38 | 39 |
| Household tenure |  |  |  |  |  |  |
| tenant | 14,606 | 75 | 23 | 15,997 | 76 | 30 |
| owner | 4,832 | 25 | 25 | 5,059 | 24 | 30 |
| Material deprivation |  |  |  |  |  |  |
| Absent | 9,843 | 51 | 14 | 8,991 | 43 | 18 |
| Present | 9,592 | 49 | 33 | 11,829 | 57 | 38 |
| Financial problems |  |  |  |  |  |  |
| no | 16,207 | 77 | 21 | 17,379 | 77 | 27 |
| yes | 4,859 | 23 | 35 | 5,191 | 23 | 41 |
| Quality of public services |  |  |  |  |  |  |
| good | 5,699 | 27 | 17 | 6,241 | 28 | 21 |
| poor | 15,367 | 73 | 27 | 16,329 | 72 | 34 |

* product of the design weight and the post-stratification weight was applied


## Models 1-3

Table 2 presents the results for the multilevel logistic regression analyses, with each set of factors being studied separately for men and women. In model 1, which included socio-demographic factors, lower educational level, older age and not working was significantly associated with poor PMH among both genders. Additionally being citizen of a non-European country was associated with poor PMH in women. In model 2, including socio-demographic and psychosocial factors, living without a partner, practicing religion rarely or never, low social support, low levels of trust, and high levels of social exclusion were significantly associated with poor PMH among both genders, independently of socio-demographic factors. Having no children was additionally associated with poor PMH in women. The strongest effect in model 2 was seen for high social exclusion with an OR of $1.82(95 \% \mathrm{Cl}=1.68-$ 1.98) for men and 1.80 ( $95 \%=\mathrm{Cl} 1.68-1.92$ ) for women. In model 3, including socio-demographic factors and material factors, all material factors, except household tenure, were associated with poor PMH among both genders, controlling for socio-demographic characteristics. The highest odds ratio was seen for material deprivation in both genders: The OR for men was 2.13 ( $95 \% \mathrm{Cl}=2.00-2.41$ ) and the OR for women was 2.17 ( $95 \% \mathrm{Cl}=2.01-2.35$ ). Urbanization level and social network were not associated with poor PMH in both genders in the respective models, and were therefore not included in model 4.

## Model 4

In model 4 the strongest associations with poor PMH among both genders were observed for higher age, social exclusion (men: $\mathrm{OR}=1.73,95 \% \mathrm{Cl}=1.59-1.90$; women: $\mathrm{OR}=1.69,95 \% \mathrm{Cl}=1.57-1.81$ ), and material deprivation (men: $\mathrm{OR}=1.96,95 \% \mathrm{Cl}=1.27-1.53$; women: $\mathrm{OR}=1.93,95 \% \mathrm{Cl}=1.79-2.08$ ). Moreover, living without a partner, lower education status, not working, practicing religion rarely or never, low social support, social exclusion, and all material factors were significantly associated with poor PMH among both genders. Not having children was independently associated with poor PMH in women only. Being citizen of a non-European country was no longer significant when taking into account all other factors in model 4.

## Country-level variation

Median odds ratios (MOR) differed only slightly between men and women, but decreased from model one to model 4, where more individual-level information was included. The MOR in model one, where socio-demographic factors are included, was 1.50 for men and 1.45 for women. However, when studying all factors together in model 4 the MOR was lower, namely 1.31 for men and 1.30 for women. Thus, country-specific variation was larger with regard to effects of socio-

Table 2 Association between socio-demographic, psychosocial, and material factors and poor positive mental health for men and women, results from multilevel logistic regression analyses, showing OR and $95 \%$ CI

|  | Men |  |  |  | Women |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | Model 1 | Model 2* | Model 3* | Model 4 | Model 1 | Model 2* | Model 3* | Model 4 |
| Socio-demographic factors |  |  |  |  |  |  |  |  |
| Age (Years) |  |  |  |  |  |  |  |  |
| 18-24 | 1.00 |  |  | 1.00 | 1.00 |  |  | 1.00 |
| 25-34 | 1.78 (1.51-2.08) |  |  | 1.65 (1.37-1.98) | 1.37 (1.20-1.56) |  |  | 1.27 (1.09-1.50) |
| 35-49 | 2.33 (2.00-2.70) |  |  | 2.26 (1.88-2.71) | 1.87 (1.65-2.11) |  |  | 1.69 (1.45-1.96) |
| 50-64 | 2.17 (1.88-2.50) |  |  | 2.44 (2.03-2.93) | 1.87 (1.65-2.11) |  |  | 1.85 (1.59-2.15) |
| 65+ | 1.77 (1.52-2.06) | , |  | 2.47 (2.03-3.01) | 1.97 (1.74-2.24) |  |  | 2.11 (1.81-2.46) |
| Education |  |  |  |  |  |  |  |  |
| Primary or less | 1.00 |  |  | 1.00 | 1.00 |  |  | 1.00 |
| Secondary | 0.66 (0.58-0.74) |  |  | 0.73 (0.64-0.83) | 0.68 (0.62-0.74) |  |  | 0.76 (0.69-0.84) |
| Tertiary | 0.50 (0.43-0.57) |  |  | 0.71 (0.61-0.83) | 0.47 (0.42-0.53) |  |  | 0.65 (0.58-0.73) |
| Working |  |  |  |  |  |  |  |  |
| Yes | 1.00 |  |  | 1.00 | 1.00 |  |  | 1.00 |
| No | 1.66 (1.52-1.81) |  |  | 1.27 (1.15-1.40) | 1.27 (1.18-1.37) |  |  | 1.13 (1.05-1.23) |
| Urbanization level |  |  |  |  |  |  |  |  |
| Countryside or village | 1.00 |  |  |  | 1.00 |  |  |  |
| Town or city | 1.01 (0.933-1.09) |  |  |  | 1.01 (0.95-1.07) |  |  |  |
| Citizenship |  |  |  |  |  |  |  |  |
| European | 1.00 |  |  | 1.00 | 1.00 |  |  | 1.00 |
| Non-European | 1.22 (0.94-1.56) |  |  | 1.01 (0.77-1.33) | 1.31 (1.05-1.63) |  |  | 1.02 (0.81-1.30) |
| Psychosocial factors |  |  |  |  |  |  |  |  |
| Marital status |  |  |  |  |  |  |  |  |
| Living with partner |  | 1.00 |  | 1.00 | - | 1.00 |  | 1.00 |
| Living alone |  | 1.20 (1.09-1.31) |  | 1.18 (1.07-1.30) | - | 1.31 (1.23-1.40) |  | 1.17 (1.09-1.25) |
| Children |  |  |  |  |  |  |  |  |
| Present |  | 1.00 |  | 1.00 |  | 1.00 |  | 1.00 |
| Absent |  | 0.96 (0.86-1.08) |  | 1.00 (0.89-1.12) |  | 0.83 (0.76-0.91) |  | 0.90 (0.82-0.98) |
| Religion |  |  |  |  |  |  |  |  |
| Practicing often |  | 1.00 |  | 1.00 |  | 1.00 |  | 1.00 |
| Rarely |  | 1.11 (1.00-1.23) |  | 1.27 (1.14-1.42) |  | 1.09 (1.01-1.17) |  | 1.24 (1.14-1.35) |
| Never |  | 1.27 (1.15-1.41) |  | 1.13 (1.01-1.26) |  | 1.27 (1.18-1.38) |  | 1.08 (1.00-1.17) |
| Social network |  |  |  |  |  |  |  |  |
| High |  | 1.00 |  |  |  | 1.00 |  |  |
| Low |  | 1.03 (0.93-1.13) |  |  |  | 1.04 (0.96-1.12) |  |  |
| Social support |  |  |  |  |  |  |  |  |
| High |  | 1.00 |  | 1.00 |  | 1.00 |  | 1.00 |
| Low |  | 1.30 (1.20-1.41) |  | 1.20 (1.10-1.31) |  | 1.44 (1.35-1.54) |  | 1.29 (1.20-1.38) |
| Political participation |  |  |  |  |  |  |  |  |
| Yes |  | 1.00 |  |  |  | 1.00 |  |  |
| No |  | 0.99 (0.91-1.08) |  |  |  | 1.03 (0.95-1.11) |  |  |
| Level of trust |  |  |  |  |  |  |  |  |

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| High |  | 1.00 |  | 1.00 |  | 1.00 |  | 1.00 |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Low |  | 1.66 (1.53-1.79) |  | 1.43 (1.31-1.55) |  | 1.51 (1.42-1.61) |  | 1.32 (1.23-1.41) |
| Social exclusion |  |  |  |  |  |  |  |  |
| Low |  | 1.00 |  | 1.00 |  | 1.00 |  | 1.00 |
| High |  | 1.82 (1.68-1.98) |  | 1.73 (1.59-1.90) |  | 1.80 (1.68-1.92) |  | 1.69 (1.57-1.81) |
| Material factors |  |  |  |  |  |  |  |  |
| Neighborhood problems |  |  |  |  |  |  |  |  |
| Low |  |  | 1.00 | 1.00 |  |  | 1.00 | 1.00 |
| High |  |  | 1.16 (1.07-1.27) | 1.13 (1.04-1.23) |  |  | 1.12 (1.04-1.20) | 1.07 (1.00-1.15) |
| Housing problems |  | A |  |  |  |  |  |  |
| Absent |  | , | 1.00 | 1.00 |  |  | 1.00 | 1.00 |
| Present |  |  | 1.46 (1.34-1.60) | 1.40 (1.30-1.52) |  |  | 1.58 (1.48-1.69) | 1.52 (1.43-1.63) |
| Household tenure |  |  |  |  |  |  |  |  |
| Tenant |  |  | 1.00 |  |  |  | 1.00 |  |
| Owner |  |  | 1.00 (0.89-1.11) |  |  |  | 1.00 (0.91-1.08) |  |
| Material deprivation |  |  |  |  |  |  |  |  |
| Absent |  |  | 1.00 | 1.00 |  |  | 1.00 | 1.00 |
| Present |  |  | 2.19 (2.00-2.41) | 1.96 (1.78-2.15) |  |  | 2.17 (2.01-2.35) | 1.93 (1.79-2.08) |
| Financial problems |  |  |  |  |  |  |  |  |
| No |  |  | 1.00 | 1.00 |  |  | 1.00 | 1.00 |
| Yes |  |  | 1.57 (1.42-1.73) | 1.50 (1.34-1.63) |  |  | 1.39 (1.29-1.51) | 1.33 (1.23-1.43) |
| Quality of public services |  |  |  |  |  |  |  |  |
| Good |  |  | 1.00 | 1.00 |  |  | 1.00 | 1.00 |
| Poor |  |  | 1.54 (1.40-1.70) | 1.39 (1.27-1.53) |  |  | 1.64 (1.51-1.77) | 1.51 (1.40-1.63) |
|  |  |  |  |  |  |  |  |  |
| Random effects |  |  |  |  |  |  |  |  |
| Country level |  |  |  |  |  |  |  |  |
| Between country variance (SE) | 0.1767 (0.05066) | 0.1265 (0.03799) | 0.08360 (0.02876) | 0.07835 (0.02697) | 0.1711 (0.04749) | 0.1258 (0.03594) | 0.08378 (0.02609) | 0.07317 (0.02314) |
| MOR | 1.50 | 1.40 | 1.32 | 1.31 | 1.48 | 1.40 | 1.32 | 1.30 |
| Region level |  |  |  |  |  |  |  |  |
| Between region variance (SE) | 0.07319 (0.01670) | 0.06726 (0.01644) | 0.08601 (0.02034) | 0.08965 (0.02038) | 0.07009 (0.01378) | 0.05600 (0.01303) | 0.05915 (0.01401) | 0.05245 (0.01312) |

*Model 2 and 3 have been adjusted for socio-demographic factors of model 1

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## DISCUSSION

This is one of the first studies to examine PMH in a large Europe wide sample and to our knowledge the first to report on a wide range of determinants. We grouped the determinants that have individually been reported in the literature with regard to mental health. Our study found a broad range of risk factors for poor PMH and our results are mainly in line with previous research that showed similar associations in single countries or single correlates, not controlling for other factors. However, most studies so far have looked at mental illness and not at PMH. Other studies covering more-positive aspects of mental health used single questions about happiness or life satisfaction. This approach is not the same as the concept of PMH, since it only covers the hedonistic perspective of wellbeing, in the sense of feeling happy.[31]

A large number of associations between socio-demographic, psychosocial, and material risk factors and PMH in citizens from 34 European countries were found in this study. Higher age, lower educational status and not working were associated with poor PMH among both genders. Of the psychosocial factors, practicing religion rarely or never, low social support, low levels of trust, and high social exclusion were associated with poor PMH among both genders. Living alone was associated with PMH in both genders. Not having children had a protective effect against poor positive mental health for women but not for men. All material determinants were associated with poor PMH among men and women.

Our results are in line with previous studies reporting that low educational level,[14, 32-34] and not working, $[14,33]$ are associated with poor mental wellbeing. The results on age and indicators of mental wellbeing are controversial, some studies reporting that older age groups are at higher risk for poor mental wellbeing,[14, 16, 32, 35] which would be in in accordance with our results, others finding the opposite.[36-38] Associations between living area and mental wellbeing have been reported, however the direction of this relationship is not clear: living in a rural area [14] and living in a large city [16] have been associated with poor PMH. When classifying living area in two categories - urban or rural - we did not find a significant association between living area and PMH. Living alone,[16, 33, 35] low social support,[13, 14, 16, 34, 39] loneliness,[14] and exclusion [40] have been associated with poor positive mental or emotional health and a study in Russia found associations between high levels of trust and high emotional health.[40] We found that not or rarely attending religious services was associated with poor PMH. A previous study reported that frequency of prayer is associated with mental wellbeing.[38] There are some studies investigating the associations of material factors and mental illness. Poor economic condition [16] and neighbourhood problems [15, 39] have been associated with poor mental wellbeing or PMH before. However, research on the effect of other material factors on PMH is lacking.

In the intermediate models 1-3 age, social exclusion and material deprivation showed the strongest association with poor PMH among men and women. These three factors also appeared to have the strongest association with poor PMH in our final model (model 4), examining the effect of all determinants together. Particularly, all material factors were significantly associated with poor PMH in the separate as well as in the complete model, taking further socio-demographic and psychosocial factors into account. This group of determinants has not been studied extensively yet in the context of PMH but rather with regard to self-rated health [21, 22] or mental illness.[41] The fact that these factors stayed significant throughout all models is in agreement with the believe that material factors may have a direct (through biological pathways) or indirect effect (through e.g. behavioural factors) on health outcomes.[22] We might not have found a significant association of household tenure and PMH because there are cultural differences between countries in the approaches of buying a house or living for rent. Hence household tenure might not be an indicator for material prosperity in all countries.

One of the limitations of this study is its cross-sectional nature. When interpreting the relationship between the determinants, it needs to be kept in mind that no causal interpretation is possible. The response rate of $41 \%$ in the third round of the EQLS was lower than aspired and differed across countries.[18] It has been argued that non-participants may be more likely to belong to low social groups and to have poorer health outcomes.[42] This would be a selection bias and the prevalence of poor PMH as well as the association between some determinants, especially material determinants, might be underestimated. This study did not take into account (mediating) behavioural factors (e.g. physical activity), which may play a role in the association with PMH. Physical activity has a positive effect on PMH [43] and it could be hypothesized that living in areas with high neighbourhood problems might hinder leisure time-physical activity, hence physical activity could be a mediating factor in the association between material factors and PMH. For future studies it would be highly desirable to also include behavioural factors. Although the WHO-5 is a validated and relatively short measure of PMH in population surveys, there are more comprehensive measures to assess this complex construct, which should be used in future studies. Moreover, in this study the cut-off point for poor PMH has been set at the $25 \%$ percentile to look at people that have low levels of PMH. Using medians or quartiles as cut-off point when no official cut-off points are available is common practice. However, a standardized cut-off point for the WHO-5 would be desirable. The study of PMH is relatively young and there is still discussion on a common definition of PMH and different measurements exist. It will take some years to achieve agreement on the appropriate measurement and definition of PMH.[10] In this context it would be highly desirable to also test if instruments are gender sensitive. This study, on the other hand has many strengths. The large dataset with comparable data across Europe, allowed us to study each gender separately and comparability of
data between 34 European countries enabled us to give an overall view of determinants of PMH among people in Europe. It used the WHO-5 as a validated measure for PMH and has analysed a broad picture of potential risk factors.

## Conclusion

This study showed independent associations between various socio-demographic, psychosocial, and material determinants and PMH. Our study provides a first overview of the distribution of determinants and their association with PMH in Europe. Thereby it can be used as a first basis for confirmatory and more specific analysis on determinants of poor PMH as well as for the development of preventive programs or policies in this context.

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STROBE Statement-checklist of items that should be included in reports of observational studies

|  | $\begin{gathered} \text { Item } \\ \text { No } \\ \hline \end{gathered}$ | Recommendation |
| :---: | :---: | :---: |
| Title and abstract | 1 | (a) Indicate the study's design with a commonly used term in the title or the abstract |
|  |  | (b) Provide in the abstract an informative and balanced summary of what was done and what was found |
| Introduction |  |  |
| Background/rationale | 2 | Explain the scientific background and rationale for the investigation being reported |
| Objectives | 3 | State specific objectives, including any prespecified hypotheses |
| Methods |  |  |
| Study design | 4 | Present key elements of study design early in the paper |
| Setting | 5 | Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection |
| Participants | 6 | (a) Cohort study-Give the eligibility criteria, and the sources and methods of selection of participants. Describe methods of follow-up <br> Case-control study-Give the eligibility criteria, and the sources and methods of case ascertainment and control selection. Give the rationale for the choice of cases and controls <br> Cross-sectional study-Give the eligibility criteria, and the sources and methods of selection of participants |
|  |  | (b) Cohort study-For matched studies, give matching criteria and number of exposed and unexposed <br> Case-control study-For matched studies, give matching criteria and the number of controls per case |
| Variables | 7 | Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable |
| Data sources/ measurement | 8* | For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group |
| Bias | 9 | Describe any efforts to address potential sources of bias |
| Study size | 10 | Explain how the study size was arrived at |
| Quantitative variables | 11 | Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why |
| Statistical methods | 12 | (a) Describe all statistical methods, including those used to control for confounding |
|  |  | (b) Describe any methods used to examine subgroups and interactions |
|  |  | (c) Explain how missing data were addressed |
|  |  | (d) Cohort study-If applicable, explain how loss to follow-up was addressed <br> Case-control study-If applicable, explain how matching of cases and controls was addressed <br> Cross-sectional study-If applicable, describe analytical methods taking account of sampling strategy |

(e) Describe any sensitivity analyses

Continued on next page

| Results |  |  |
| :---: | :---: | :---: |
| Participants | 13* | (a) Report numbers of individuals at each stage of study-eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed |
|  |  | (b) Give reasons for non-participation at each stage |
|  |  | (c) Consider use of a flow diagram |
| Descriptive data | 14* | (a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders |
|  |  | (b) Indicate number of participants with missing data for each variable of interest |
|  |  | (c) Cohort study-Summarise follow-up time (eg, average and total amount) |
| Outcome data | 15* | Cohort study-Report numbers of outcome events or summary measures over time |
|  |  | Case-control study-Report numbers in each exposure category, or summary measures of exposure |
|  |  | Cross-sectional study-Report numbers of outcome events or summary measures |
| Main results | 16 | (a) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, $95 \%$ confidence interval). Make clear which confounders were adjusted for and why they were included |
|  |  | (b) Report category boundaries when continuous variables were categorized |
|  |  | (c) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period |
| Other analyses | 17 | Report other analyses done-eg analyses of subgroups and interactions, and sensitivity analyses |
| Discussion |  |  |
| Key results | 18 | Summarise key results with reference to study objectives |
| Limitations | 19 | Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias |
| Interpretation | 20 | Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence |
| Generalisability | 21 | Discuss the generalisability (external validity) of the study results |
| Other information |  |  |
| Funding | 22 | Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based |

*Give information separately for cases and controls in case-control studies and, if applicable, for exposed and unexposed groups in cohort and cross-sectional studies.

Note: An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at http://www.plosmedicine.org/, Annals of Internal Medicine at http://www.annals.org/, and Epidemiology at http://www.epidem.com/). Information on the STROBE Initiative is available at www.strobe-statement.org.


[^0]:    Mental Health and its determinants have been examined in numerous studies. However, the focus has mainly been on mental ill-health. Yet, food mental health is more than just the absence of mental illness

    The positive dimension of mental health is also stressed in WHO's definition of health as stated in its constitution: "Health is a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity."

    Nevertheless there is agreement that a multi-dimensional measure is needed to accurately assess PMH

    These two concepts are not two opposite sides of one-continumm but rather constitute distinct, though correlated, axes with independent determinants. Keyes' two-continua model demonstrates this way of looking at mental illness and PMH. The one continuum reflects the presence or absence of mental illness, and overlaps in part with the other continuum, which represents the presence or absence of PMH.

